CLAIMS

1.   A method of testing a food product, comprising the steps of:

selecting a sample of a food product having a predetermined target characteristic, the characteristic being a sensory characteristic, physical characteristic, a processing condition, or ingredient information;

assaying the sample to derive a genetic profile of the sample food product;

generating an output distribution of the genetic profile, the distribution representing the microbial population of the sample food product; and

correlating the output distribution with the target characteristic in a manner that enables prediction of the presence of the target characteristic in a food product based on a microbial population of that food product.

2.   The method of claim 1, wherein the step of correlating includes storing information about the target characteristic and the output distribution of the sample food product in a database such that the information about the target characteristic is stored as a function of the output distribution of the sample food product.

3.   The method of claim 2, wherein the steps are repeated and the database represents information collected for a plurality of samples of the food product.

4.   The method of claim 2, further including the step of predicting the presence of the target characteristic in another sample of a food product by:

assaying another sample of a food product to derive a genetic profile, the other sample originating from a different source than the sample having the predetermined target characteristic;

generating an output distribution representing the microbial population of the other sample using its genetic profile; and

comparing the output distribution of the other sample to the database to detect for the presence of the target characteristic in the other sample.

5.   The method of claim 1, wherein the step of assaying includes the step of hybridizing genomic material in the sample to a probe matrix having an array of probes, each probe representing a species of microorganism.

6.   The method of claim 5, further including the steps of:

culturing the sample to increase populations of microorganisms present in the sample;

extracting nucleic acid from the microorganisms; and

labeling gene regions prior to detection with the probe matrix.

7.   The method of claim 5, further including the step of amplifying the gene regions prior to labeling.

8.   The method of claim 1, wherein the sensory characteristic is selected from the group consisting of color, size, shape, viscosity, clarity, smell, consistency, texture, and flavor.

9.   The method of claim 1, wherein the physical characteristic is selected from the group consisting of pH, acidity, redox potential, moisture content, preservative content, nutrient content, fat content, sugar content, starch content, nitrogen content, and shelf-life.

10.   The method of claim 1, wherein the processing condition is selected from the group consisting of time-temperature combinations for heating or cooling, rate of evaporation, rate of cooling, pressure, time-intensity combinations for irradiation.

11.   The method of claim 1, wherein the ingredient information is selected from the group consisting of suppliers of the ingredient, origin of the ingredient, genotype of the ingredient, and period of growth of the ingredient.

12. The method of claim 5, wherein the species of microorganism is a foodborne species affecting food quality.

13. The method of claim 13, wherein the foodborne species is selected from the group consisting of food product colonizing species, environment colonizing species, and mammalian colonizing species.

14. The method of claim 1, wherein the output distribution represents the quantity of each microorganism in the microbial population.

15. A system for testing and characterizing a food product, comprising:

a multispecies array having a plurality of DNA probes for identifying the microbial population of the food product, each probe being configured to detect a gene sequence specific to a microbial species or strain;

a data processing module comprising an array reader that retrieves output data representing the identified microbial population from the array, and a data recorder that saves the output data into a database; and

an informatics module that correlates the output data with information relating to a target characteristic of the food product and which information has been recorded in the database.

16. The system of claim 15, wherein each probe is configured to detect a different gene sequence.

17. The system of claim 15, wherein a plurality of the probes are configured to detect the same gene sequence.

18. The system of claim 15, wherein the target characteristic is selected from the group consisting of a sensory characteristic, physical characteristic, a processing condition, and ingredient information.

19.   The system of claim 15, wherein the data processing module further determines the abundance of the microbial species or strain in the food product.

20.   The system of claim 15, wherein the informatics module compares the output data with the target characteristic information in a manner that enables prediction of the presence of the target characteristic in a similar food product based on a microbial population of that food product.

21.   The system of claim 15, wherein the system forms part of a food product processing line.

22.   The system of claim 15, further being fully automated.